
STUDY REGARDING THE EFFICIENCY OF PUBLIC SPENDING ON EDUCATION AT EU LEVEL THROUGH BENCHMARKING

MIHAIU Diana

Lucian Blaga University of Sibiu, Romania

Abstract:

The objective of this paper is to review the efficiency of public expenditure for education in Romania compared to other EU countries, and to the EU average. Thus we proceeded to a benchmarking analysis. In order to perform an analysis of public spending efficiency for education by benchmarking at the EU level, representative indicators must be chosen in order to quantify the volume of efforts and effects. The effort of education was represented by public expenditure on education as percentage of GDP, and the effects took the form of a composite indicator consisting of 19 sub-indicators. If the public sector effort was relatively easy to quantify, the effects involve a deeper analysis and determine the limitations of this study. The conclusion is that either the level of funding in Romania is oversized compared to its effects, or resources were not used properly in accordance with the principles of performance. It would be foolhardy to suggest increased funding for education, when the analysis carried out shows that the volume of financing is not the problem, but towards the use of funds.

Keywords: public sector, education, efficiency, benchmarking

1. Introduction

Measuring efficiency and effectiveness in education is particularly important considering that resources are often limited while the need for such resources is often limited. These concepts are used to monitor and assess how well resources are used in education and to create a priority in the use of such resources. There are a number of techniques are often used to measure the efficiency of educational systems, such as: estimates based on regression or parametric methods, non-parametric methods, cost-benefit analysis, cost-effectiveness analysis, measurement of rate of return in education.

a) Parametric methods used in measuring the efficiency of educational system:

- **Ordinary Least Squares (OLS):** is one of the methods involving parametric regression analysis. OLS analysis places a line which minimizes the sum of squared vertical distances from observed output.
- **Stochastic frontier analysis (SFA).** A very common parametric approach is the Stochastic Frontier Analysis (SFA). It is a statistical method based on econometric models. This approach assumes a specific functional form for the relationship between input and output. The advantage of this method is that it is able to cover the effects of exogenous shocks, i.e. nondiscretionary factors. The model can specify the equations based on such assumptions (Mandl et al., 2008, p. 9; Aleksander Aristoynik, p.6).

b) Non-parametric methods: Data Envelopment Analysis (DEA)

The DEA methodology assumes the existence of a convex production frontier. The production frontier in the DEA approach is constructed using linear programming methods (António Afonso, Ludger Schuknecht and Vito Tanzi , 2008, p.21).

DEA can be used as an alternative to techniques based on regression is a nonparametric method. It does not involve statistical estimates, but instead makes use of linear programming and other forms of mathematical programming methods to characterize the set of efficiency ratios. There are a number of advantages on the DEA analysis, namely:

- Recognize a complex non-linear (concave or convex) relation to exist between output and costs, while regression usually restrict this kind of relationship on the basis that are either linear or simple shapes that are non-linear;
- Can operate with multiple input-output models;
- Inputs and outputs can have many different units of measurement.

c) Cost-Benefit analysis

Achieving the economic analysis includes identifying all costs and benefits, the availability of relevant data collection, valuation, updating and comparing the net present value of the proposals under consideration. The cost benefit analysis takes into consideration economic efficiency that is why the result of this analysis will indicate the options of less expensive public politics and those that assure more benefits. Every spent monetary unit will assure maximum benefits.

Cost-benefit analyses can be applied when costs and effects can be measured in monetary terms. Because is almost impossible to evaluate the effects of an educational process into a safe monetary quantity, cost-benefit analysis therefore cannot be applied into an educational context. For example a training program is more plausible to be evaluated in monetary terms, therefore cost-benefit can be adequate to this situation (Emmanuel Jimeney Şi Harry Anthony Patrinos, 2008).

Education costs are often understood as being educational expenditures. For CBA the costs must be expressed as being opportunity costs, which means

completeness of the resources involved in that option. At the same time, the educational system uses other resources with alternative use, that normally do not reflect in educational expenditures, like the time of the pupil or student that does not work by deciding to continue studying. This is a loss for the current productive capacity and a loss for current GDP of economics, overall a loss for the person's individual income. The opportunity cost must be included in economic analyses. Since education is seen as a form of social investment, then the relevant cost is represented by the sum of all economic resources allocated (social costs). This includes the time value of teachers, books, didactic materials and other goods and services, the amount of building and equipment usage, student time.

Education benefits are not only of financial nature, expressed in a higher salary income due to the studies made. Education is but a number of indirect benefits and externalities. Indirect benefits are not necessarily economic in nature, including social and cultural benefits. They are not economic benefits for the individual, for example personal satisfaction generated by education, known collectively as the consumption value of education, different from investment aspects. There are also external benefits, public, externalities that are not of economic nature, by transmitting the effects of education to others (dissemination effect). The literature has proposed several methods of measuring the benefits of education such as, for example, increase health, reduced fertility among women with low education, increased educational performance for children of educated mothers, but some benefits are almost impossible to assess accurately in monetary terms (Secretariatul General al Guvernului, Direcția de Politici Publice, 2009, p.28-29).

d) *Cost-effectiveness analysis*

This analysis is applied when costs are expressed in monetary terms and effects are measured in non-monetary terms (but quantifiable, for example the number or percent of graduates of a course). In order to compare two alternative educational systems, either costs or effects of both alternatives must be fixed. When costs are the same for both alternatives, the system more effects is more efficient. When effects are the same for both alternatives, the system with less cost is more efficient. Often the exact measurement of effects in an educational system is very difficult. A less elaborated version of cost-effectiveness analyses requires assumption of equal benefits for considered options, which transforms the analyses into a *cost minimization analysis*; decision was taken based on the assessment of costs in monetary terms. In this case economic evaluation aims to find the alternative with the lowest costs.

e) *Education rate of return*

The concept of external effectiveness is often measured by analyzing the rate of return to education. Return rate is a measure of the effects achieved over time compared with the initial cost of education. Return rates can be measured from the

individual point of view or society point of view. Private return rates measure the future net economic income from an individual in relation with “the quantity” of gained education, while social return rates measure the benefits to society made by education. Calculation formulas for both types are the same; just the costs and benefits that are implicated are different between the two.

A **number of difficulties** are being met when a significant measurement of efficiency is tried. These are:

- Difficulties in identifying educational components that are relevant to the analysis.
- Determining the way to measure components;
- Difficulties in estimating costs – this includes problems collecting data about private costs in education both inside and outside educational institutes;
- Methodological problems regarding measuring the outputs and effects of education

To truly measure effectiveness of an educational system, the inputs and process must relate to effects. The educational system can be seen as being made out of four main components.

- Inputs: these are the real resources used in education, curricular area, books, facilities and equipment, and financial resources
- Processes: these represent the interactions between inputs and students, between different inputs and teaching/learning processes
- Outputs: these are the direct and immediate results of education, for example the number of graduates.
- Outcomes: these are effects of education, for example income increase of qualified labor force, productivity increase, health improvement and other non-monetary results (European Research Associates, 2006).

2. Analysis of the efficiency of public expenditure on education, through benchmarking

As seen from the previous information, ***efficiency analysis implies a relation between efforts (inputs) and effects (outputs), and from a mathematical point of view can be as a ration between the sum of effects and the sum of efforts*** (in this case a ratio greater than one means a higher efficiency), or the other way around, as a ratio between the effort sum and the effect sum (in this case a ratio with a lower value means a higher efficiency).

In order to perform an analysis of public spending efficiency for education by benchmarking at the EU level, representative indicators must be chosen in order to quantify the volume of efforts and effects.

Public sector education effort is given by the total public expenditure on education, and to assure data comparison between member states and eliminate influences made by different levels of development of these states, ***it has been***

chosen as an effort indicator, the percent from GDP allocated to education (public expenditures for education % GDP), expressed both per total education and per its levels (primary, secondary and tertiary).

If the public sector effort was relatively easy to quantify, the effects involve a deeper analysis and **determine the limitations of this study**. Education effects are both direct (tuition rate, literacy rate, number of graduates) and indirect (influence on unemployment, wage influences on the individual, the country's economic welfare, the increasing competitiveness both at the micro level as and macro), and the latter are difficult to quantify the influence strictly in relation to education, wage level of an individual depends not only on his studies but also on his talent, his skill, on the responsibility of the job involved.

Education should be seen as a priority area for national investment in human capital, which not only produce immediate effects, which often are not the most important, but continue to produce medium and long term effects on economic and social life of a nation, effects are often not counted because of their inability to quantify.

Efficiency of education can be viewed from several angles, can be viewed from the perspective:

- Of the student, through the efforts and the effects that produce them personally;
- Of State, through the macroeconomic efforts and effects.

The first option involves much subjective analysis, each individual perceives it differently its effectiveness of studies and is suitable especially for internal analysis, so I'll stop in this study on the analysis of efficiency of public spending for education, i.e. from a macroeconomic perspective.

The purpose of this analysis is to identify the countries that have achieved the highest efficiency in this area. It is also important to determine the EU average for Romania to be able to determine the distance to the average value and to the top efficiency states in education. It will be examined the efficiency of the entire public school system, but also its levels: efficiency of primary, secondary and tertiary levels.

The indicators chosen in the comparative study are presented in the following table, and values are taken from official reports of international bodies mentioned as the source. These indicators are input indicators, process, outputs and outcomes, attempting to cover as closely as efficiency dimensions.

It is important that the indicators for education systems to comply with several conditions, such as (Moșteanu Tatiana, Gherghina Rodica^{2009, p.378}):

- Must allow multi-dimensional coverage of the education system;
- Should allow comparison with the indicators used by international organizations and European organizations that need to be reported;
- Must cover the main areas of educational policy;
- Should allow multiple uses on the annual evaluation of the education system, and analysis at both central and regional level;
- Must contain information with a certain power to allow sector size analysis and caution in analyzing statistical data.

Table 1. Indicators of effort and effect analysis of public expenditure on education

	Selected indicators	Source
Effort indicators	Public expenditures for education % GDP	European Commission, Eurostat
	Public expenditures for primary education % GDP	Eurostat
	Public expenditures for secondary education % GDP	Eurostat
	Public expenditures for tertiary education % GDP	Eurostat
	E ₁ . Rate of primary education dropout	World Bank Statistics
	E ₂ . Rate of primary education graduates that continues the secondary education	World Bank Statistics
	E ₃ .Rate of primary education registration	Eurostat
	E ₄ .Rate of graduation primary education by the ones registered	Eurostat
	E ₅ .Percent of population over 15 years that graduated primary studies	World Bank Statistics
	E ₆ . Rate of following the secondary education	Eurostat
	E ₇ .Labor force from the secondary education level graduates	World Bank Statistics
	E ₈ .Percent of population over 15 years that have graduated secondary studies	World Bank Statistics
	E ₉ .Percent of students that obtained the maximum performance score in the PISA test	UNESCO
	E ₁₀ .Country rank after the results of the PISA test	UNESCO
	E ₁₁ .Rate of unemployment among graduates of	Eurostat

Effects indicators	secondary education	
	E ₁₂ .Rate of graduation of tertiary education at 1000 inhabitants 20-29 years	Eurostat
	E ₁₃ .Percent of population with university studies	World Bank Statistics
	E ₁₄ .Labor force from the university studies graduates	World Bank Statistics
	E ₁₅ .Unemployment rate among university studies graduates	Eurostat
	E ₁₆ .Enrolement rate in the tertiary education (number of students in 100 000 inhabitants)	Eurostat
	E ₁₇ .Rate of early school dropout between 18-24 years	Eurostat
	E ₁₈ . Percent of population having the age between 25-64 years that have graduated at least upper secondary education	World Bank Statistics
	E ₁₉ .Rate of adult participation in continuous training programs	Eurostat

Note: the date is from year 2007 to assure comparison of all data; results of PISA test are for the year 2006, last reported.

Total effects of education are constructed like this:

$$E_t = (E_{inv. \text{ primar}} + E_{inv. \text{ secundar}} + E_{inv. \text{ tertiar}} + E_{17} + E_{18} + E_{19})/6, \text{ where}$$

$$E_{inv. \text{ primar}} = (E_1 + E_2 + E_3 + E_4 + E_5)/5$$

$$E_{inv. \text{ secundar}} = (E_6 + E_7 + E_8 + E_9 + E_{10} + E_{11})/6$$

$$E_{inv. \text{ tertiar}} = (E_{12} + E_{13} + E_{14} + E_{15} + E_{16})/6$$

Given the fact that the indicators are expressed in different units of measurement, data standardization has become a process that was done after the following procedure:

- For parameters which are to be maximum optimized, the standardized value of the indicator was calculated by comparing the maximum value in the series ($x_{i \text{ standardize}} = x_i/x_{\max}$).
- For parameters which are to be minimum optimized, the standardized value of the indicator was calculated so: $x_{i \text{ standardize}} = (x_i/x_{\max})^{-1}$, where x_{\max} represents the smallest value from the mathematics point of view.

The results of the standardization process and quantification of the effort and effects of education for the public sector, for EU member states, are presented in the below tables:

Table 2. Standardized public effort for education and standardized effects

COUNTRY	STANDARDIZED EFFORT				STANDARDIZED EFFECTS			
	Public expenditures education % GDP							
	TOTAL	Primary	Secondary	Tertiary	TOTAL	Primary	Secondary	Tertiary
Austria	0.692	0.429	0.832	0.655	0.608	0.604	0.591	0.522
Belgium	0.769	0.628	0.851	0.572	0.562	0.609	0.573	0.746
Bulgaria	0.526	0.363	0.607	0.297	0.470	0.691	0.337	0.533
Cyprus	0.885	0.863	1.000	0.703	No data	0.683	No data	0.603
Czech Republic	0.538	0.257	0.670	0.467	0.671	0.563	0.738	0.529
Denmark	1.000	0.823	0.924	1.000	0.735	0.911	0.524	0.643
Estonia	0.615	0.500	0.743	0.467	0.605	0.611	0.582	0.737
Finland	0.756	0.531	0.832	0.808	0.768	0.911	0.774	0.800
France	0.718	0.518	0.842	0.537	0.513	0.590	0.511	0.601
Germany	0.577	0.279	0.743	0.498	0.572	0.608	0.623	0.543
Greece	0.513	No data	No data	No data	0.466	0.687	0.327	0.652
Hungary	0.667	0.438	0.756	0.450	0.525	0.582	0.551	0.582
Ireland	0.628	0.761	0.670	0.498	0.590	0.737	0.587	0.801
Italy	0.551	0.478	0.653	0.332	0.440	0.850	0.368	0.378
Latvia	0.641	0.549	0.696	0.406	0.505	0.488	0.379	0.680
Lithuania	0.603	0.296	0.795	0.441	0.599	0.604	0.454	0.788
Luxembourg	0.397	0.748	0.482	No data	0.549	0.563	0.480	0.382
Malta	0.872	No data	No data	No data	No data	0.787	No data	0.475
Netherlands	0.679	0.584	0.713	0.633	0.630	0.604	0.756	0.586
Poland	0.628	0.704	0.624	0.406	0.624	0.507	0.519	0.618
Portugal	0.679	0.655	0.690	0.524	0.405	0.995	0.365	0.395
Romania	0.538	0.372	0.502	0.489	0.454	0.564	0.408	0.561
Slovakia	0.462	0.296	0.558	0.345	0.621	0.564	0.501	0.510
Slovenia	0.667	1.000	0.383	0.528	0.753	0.916	0.639	0.600
Spain	0.551	0.487	0.548	0.432	0.485	0.853	0.399	0.603
Sweden	0.859	0.743	0.871	0.773	0.708	0.799	0.651	0.669

United Kingdom	0.692	0.730	0.809	0.410	0.653	0.840	0.552	0.741
Average	0.637				0.58			

Source: own calculations

It was decided removal of Malta and Cyprus from the analyses due to lack of data. The level of efficiency of the public expenditures for education, determined as the ratio between standardized effects (benefits) and effort (costs) is presented in the next table. For a country to reach the level of efficiency of public expenditures for education this ratio must be greater than one, this implies superior benefits of costs. A sub unitary ration characterizes weak efficiency, or even the lack of it, because obtained results are not rising to the efforts made.

Table 3. Efficiency level of the public expenditures for education at the level of EU countries

EFFICIENCY OF PUBLIC EXPENDITURES IN EDUCATION				
COUNTRY	TOTAL	PRIMARY	SECONDARY	TERTIARY
Luxembourg	1.369	0.753	0.997	No data
Slovakia	1.347	1.903	0.898	1.479
Czech Republic	1.247	2.195	1.102	1.134
Slovenia	1.130	0.916	1.670	1.136
Finland	1.016	1.718	0.932	0.990
Poland	0.994	0.721	0.833	1.522
Germany	0.992	2.182	0.839	1.092
Lithuania	0.991	2.040	0.571	1.788
Estonia	0.983	1.224	0.784	1.579
United Kingdom	0.944	1.151	0.683	1.807
Ireland	0.940	0.969	0.877	1.609
Netherlands	0.927	1.035	1.061	0.926
Greece	0.910	No data	No data	No data
Bulgaria	0.895	1.907	0.555	1.798
Spain	0.880	1.754	0.729	1.396
Austria	0.878	1.407	0.711	0.798
Romania	0.845	1.518	0.815	1.148
Sweden	0.825	1.076	0.748	0.866
Italy	0.799	1.780	0.564	1.141

Latvia	0.789	0.890	0.545	1.675
Hungary	0.788	1.329	0.730	1.294
Denmark	0.736	1.107	0.568	0.644
Belgium	0.731	0.970	0.674	1.305
France	0.715	1.141	0.607	1.119
Portugal	0.597	1.520	0.530	0.754
EU Average	0.94			

Source: own calculations

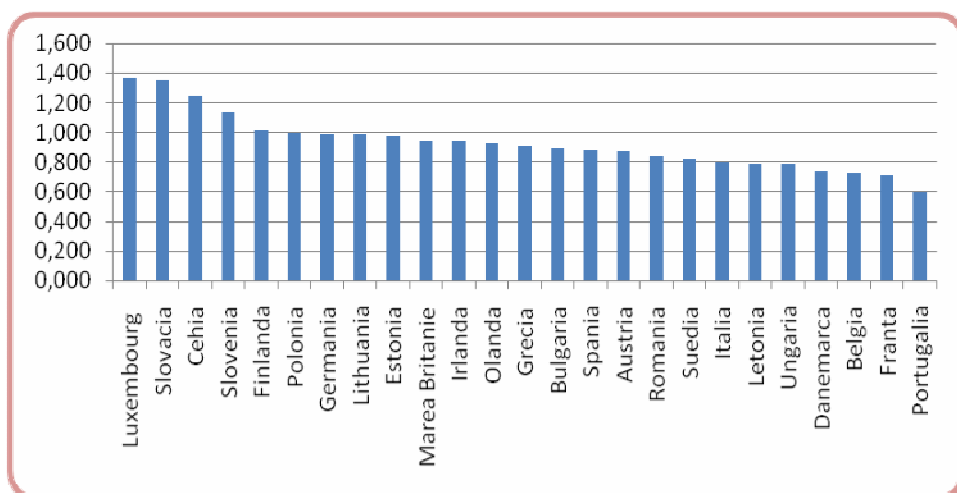


Figure 1. EU country standings after the level of efficiency of the public expenditures for education

After the efficiency analyses of the public expenditures for education, with benchmarking results one can observe that the countries that obtained more results (effects) per cost unit are: Luxembourg, Slovakia, Finland and Poland. All these countries have an efficiency indicator greater than one, this means that effects outworked costs. Between the low efficiency countries is Portugal, France and even Belgium and Denmark. It may seem paradoxical that a developed country like Denmark to be situated on the lower part of the standings, but if you look at the raw data is easy to detect the cause: Denmark distributes almost 8% from GDP for education, registering the greatest effort, but even if the effects are greater than average, are not proportionally to the registered effort. Another apparent paradox may be in the case of Luxembourg, which although registers results below average, is leading the standings, and this due to the fact that Luxembourg distributes the lowest percent from GDP to education, about 3%, but in absolute quantity this percent means 14 000 EUR to PPC per student, representing the greatest allocation in the EU. The calculation of this efficiency indicator must be therefore understood: **maximum results**

obtained per effort unit. This explains why some countries have registered results below average and declared efficient; the made expenditure for obtaining those results was also reduced.

Romania has an efficiency indicator of public expenditures for education of 0.845, sub unitary, meaning that results are not correlated to the made efforts, and lower with 11% compared to the EU member countries average (except Malta and Cyprus).

Creating a standing of countries which registered the best results (effects) in the education domain we will observe the first positions are occupied by: Finland, Slovakia, Denmark, Sweden, Czechoslovakia, Great Britain; but a part of these countries, like the case of Denmark, have obtained favorable results with a great level of effort compared to other member states. As it can be noticed from the next graphic, Denmark registers the greatest discrepancy between the level of effort and the one of effects, followed by Belgium. **Balanced countries from the made effort perspective with the results obtained are: Austria, Finland, and Germany.**

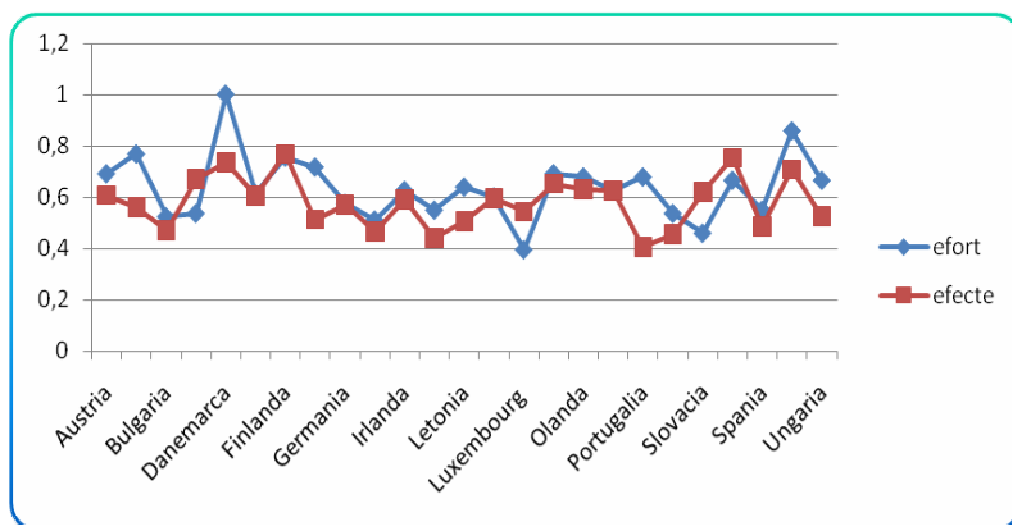


Figure 2. Effort-Effect relation in public education from EU

Creating a comparison between Romania and EU average for the efficiency of public expenditures for education it can be observed Romania stands below the average, in 20076 distributes 4.2% from GDP financing public education, meanwhile the EU average of that year was 5.11%, in 2008 Romania raised the percent allocated to education to 6% from GDB, but in absolute values the average financing per student remains very low, Romania occupying the last position.

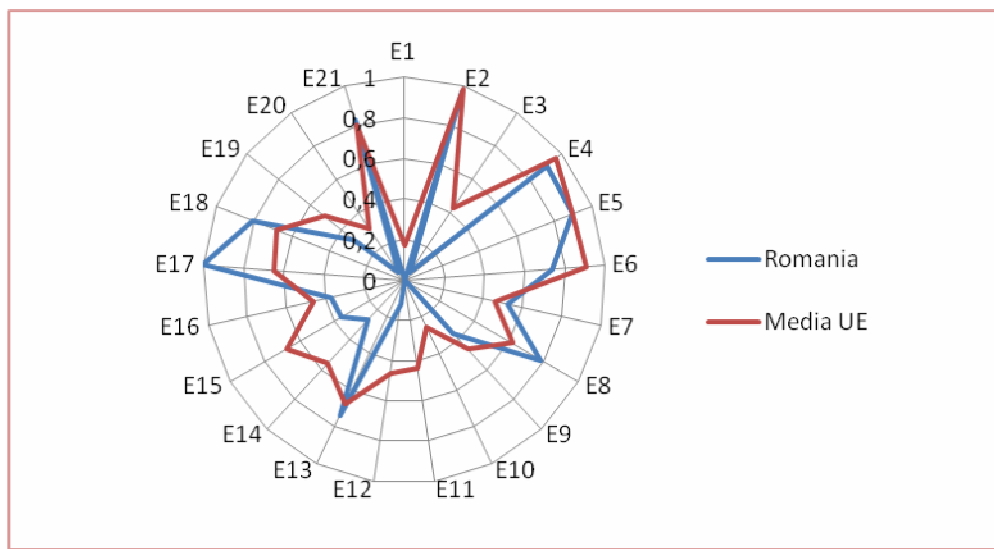
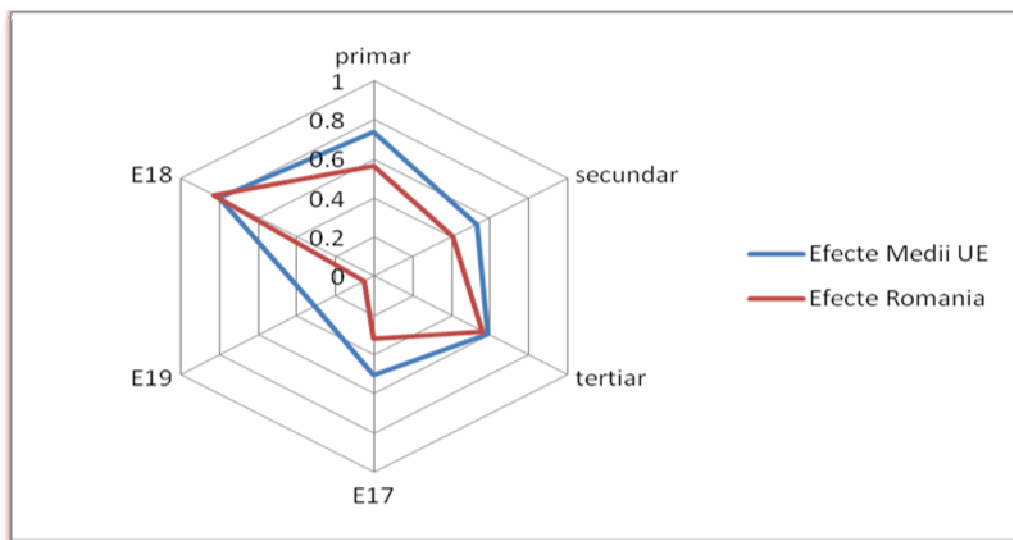


Figure 3. Education results in Romania compared with the EU average



Educations results in Romania can be seen in the above graphic, are inferior to the EU member states average, both on the overall education system and on the levels. *The results of the tertiary education is close to average, but analyzed by components it can be noticed that due to quantity factors this result happened: large number of students at 100 000 inhabitants; from the quality factors point of view the situation is not favorable regarding the degree of labor occupancy of graduates.* The unemployment rate among university studies graduates is over 10% in Romania,

meanwhile the EU average is somewhere at 6%, and countries like Holland or Great Britain have a rate of unemployment of 3-4%.

Another problem that Romania is facing is the high rate, about 17%, of early quitting of education by young people having the age between 18 and 24 years. Another sensitive aspect for Romania, that places the country at the penultimate position in the EU member states, is the rate of adults between 25 and 65 years participation in continuous training programs. The value of this rate is 1.5% in Romania, compared with an average of almost 10%. The only dimension from those analyzed, that places Romania over the EU average, is the percent from the population having between 25 and 64 years which graduated at least post high school studies. Romania emerges a path towards the EU average in issues relating to education, but priority is leaning toward **quantitative indicators**, ignoring key issues such as school dropout rate in primary and early education (18-24 years) unemployment rate among graduates regardless of their studies, which show a weak capacity of insertion, educational supply mismatch and labor market needs, poor development of programs to facilitate transition of students from school to the labor market, reduce rate participation of adults in continuing education programs that will affect the competitiveness of labor mediocre results of PISA test of the Romanian students in mathematics, science and reading. In order to overcome these deficiencies, Romania should use available resources rationally, not necessarily to increase funding for that at the current level of funding is room for additional results. For example Czech Republic allocated in 2007 the same percent of 4.2% from GDP to education, same as Romania, but occupies the third place in top of efficiency; meanwhile Romania occupied the 17th place. With the same effort, Czech registers a rate of primary school dropout of 1%, a rate of early dropout of 5.4%, the rate of adult participation in continuous training programs of about 7%, aspects that can be analyzed from the below table:

Table 4. Comparison Romania – Czech Republic - Germany

COUNTRY	Public expenditure % GDP (2007)	Rate of primary school dropout	Rate of unemployment of secondary school graduates	PISA Rank	Rate of unemployment of tertiary school graduates	Rate of school dropout 18-24 years	Continuous education % 25-64	% of population between 25-64 years that have graduated at least secondary school	Efficiency Rank
CZECH REP	4.2	1.00	8.00	18	3.30	5.40	6.80	90.5	3
GERMANY	4.5	4.00	9.90	20	4.90	11.10	7.80	84.4	7
ROMANIA	4.2	7.00	10.00	3	6.40	16.60	1.50	75.0	17

Source: own calculations

It can be observed that with a very close level of effort with the one of Romania, Czech Republic and Germany have obtained superior results.

3. Conclusions

The conclusion is that either the level of funding in Romania is oversized compared to its effects, or resources were not used properly in accordance with the principles of performance. It would be foolhardy to suggest increased funding for education, when the analysis carried out shows that the volume of financing is not the problem, but towards the use of funds. For this purpose we recommend, in case of Romania, a careful and rational use of funds, a budget based on clearly defined objectives and performance measured by indicators, and after the process has been improved may be taken to increase public expenditure on education as the process is implemented to generate enhanced results.

We believe that to be able to achieve an optimal level of efficiency of public spending on education, Romania needs to move away from sequential and isolated steps and relate to educational policies with other policies and socio-economic measures. Failing to fund the training of students who will not find a job and inefficiency in this area will click and will also reflect on the state budget through spending on social protection of these new unemployed. Incentives measures for access to education, increase the enrollment rate in education at all levels of education should be linked to incentives measures for the creation of new jobs by the private sector with measures to facilitate the transition from school to work with providing financial aid to children from disadvantaged social classes in order to ensure equal opportunities.

4. References

- Aleksander Aristovnik - *Public sector efficiency and effectiveness – an application to the new EU member states and Croatia*.
- António Afonso, Ludger Schuknecht and Vito Tanzi (2008) - *Income distribution determinants and public spending efficiency*, European Central Bank WORKING PAPER SERIES NO 861 / JANUARY 2008.
- Emmanuel Jimeney Și Harry Anthony Patrinos (2008) - *Can Cost Benefit Analysis Guide Education Policy In Developing Countries*, The World Bank, Human Development Network, Education Team, Policy Research Working Paper 4568.
- European Research Associates (2006) - *Key Education Indicators On Social Inclusion And Efficiency*, Brussels.
- Moșteanu Tatiana, Gherghina Rodica (2009) - *The Need Of Using Indicators In Sizing The Efficiency Of Expenditure For Education*, Analele Universității Din Oradea, Științe Economice.
- Secretariatul General al Guvernului, Direcția de Politici Publice (2009) - *Manual și metodologie pentru studii de impact în domeniul sănătății*.